

# Development of Learning Devices Using Problem Based Learning Model Based on Malay Culture to Improve Students' Problem Solving Skill and Self-Regulated Learning

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## Abstract

The purpose of the study were to analyse the validity, practicality and effectiveness of learning devices using problem based learning model based on Malay culture and to analyse the improvement of students' problem solving skill and self-regulated learning by applying learning devices using problem based learning model based on Malay culture. This study was Research and Development (R&D) by using 4-D model include define, design, develop, and disseminate stages proposed by Thiagarajan with limited trial. Learning devices were developed in the form of lesson plan, student worksheet, students' book, teachers' book and instrument problem solving skill of physics on elasticity material and questionnaire self-regulated learning. All of the learning devices were based on Malay Culture. Subjects in this study were students of class X MIA III SMA Negeri 1 Tanjung Pura. The result of the research shows that the learning devices using problem based learning model based on Malay were validity, practical and effective model and the problem solving skill of physics and the self-regulated learning by applying the learning devices using problem based learning model based on Malay culture were increase.

**Keywords:** development, learning devices, problem based learning, Malay culture, problem solving skill, self-regulated learning

## 1. Introduction

Physics is one of the science subjects that have an important role in improving the quality of education. Through physics learning students are expected to have character, have a scientific skill, students can solve problems in life and students can develop the knowledge they have (Depdiknas, 2006).

The solve problems skill is very important to be improved in learning. According to Padjono & Wardaya (2009) during the problem solving, students get experience in the thinking process, try hypotheses and if successful solve problems then the students get something new. Based on this explanation it is seen that there are stages of problem solving. Where through the stages students have experience, build knowledge and get something new. This will not be obtained by the students if the teacher's model does not support student's problem solving skill.

Problem-solving skills are a skill that can be gained if teachers apply learning model that can improve problem-solving skills. According to Inel & Balim (2010) the learning model using constructivist approach can improve student's problem solving skills, where the constructivist approach teaches students to take an active role in building their knowledge in the learning group and solve the problems around them. Constructivist approach is a learning approach that invites students to think and construct in solving a problem together. Constructivism approach gives teacher role only as facilitator as well as guiding and directing students to build their own knowledge by actively involved in learning process.

In addition to problem-solving skills, physics learning should also be able to train aspects of attitude to students. Based on Permendikbud No. 20 of 2016 states that the Graduate Competency Standards (SKL) covers aspects of attitude, knowledge and skills. Aspects of attitude cannot be formed easily in a single meeting of learning, attitude cannot be taught, but can be trained through the phases in the learning process. So it takes the application of a model that has phases that can training attitude to students. Of course a model that facilitates students to play an active role, so that students can be directly involved in the learning process.

One of attitude that can be trained in learning is the independence of learning. According to Boakaerts, et al (2000) the independence of student learning will be achieved through opportunities provided for students in organizing their learning process, the exercises used to enable knowledge, elaboration provide new learning connections with preliminary learning, linking past and new knowledge, time and environmental controls in which students can manage their own environments and strategies in learning.

Self-regulated learning is a necessity and demand in education because according to Woltres, et al (2003) self-regulated learning is an active, constructive process for students who make student goals to learn and try to maintain, regulate and control the knowledge, motivation and habits of students themselves, Where it is guided and built on the goals created by students and contextual problems within the environment. Through the cultivation attitude of self-regulated learning to give a very big impact for students, where students are trained to have the willingness and enthusiasm to learn on the encouragement in him that is learning goals that have been

formed within him. In addition, students can take the initiative and be responsible to play an active role in terms of learning planning, learning process and learning evaluation. The greater the student's active role in these activities, indicating that the student has a high level of self-regulated learning.

In response to the problems that occur in there are efforts that can be done among others (1) improve learning planning related learning devices, (2) learning process related learning model used by teachers and (3) evaluation of learning related to the preparation of questions to measure achievement of learning objectives.

Learning device is an important part of a learning process, is also a guideline for teachers in implementing the learning process in the classroom. It aims to determine the extent to which learning materials have been presented, what indicators to be achieved, to how the follow-up will be done by the teacher. In addition, the learning device also aims to help the students to follow the learning process well. According Akker (1999) the quality of instructional devices used determine the quality of learning. A quality learning device is a learning device that meets the quality criteria of a device that is validity, practicality and effectiveness.

In addition to the use of quality learning device, to improve the solvency of student' problem solving and self-regulated learning required an application of the right learning model. Appropriate learning model to improve student' problem solving skill and self-regulated learning is a model problem based learning (PBL). According Arends (2008) PBL is a learning model that aims to help students develop their thinking skills, problem-solving skills, and intellectual skills, learn the role of adults, and become independent learners.

The process of applying PBL in learning has its own characteristics. According to Allen, et al (2011: 21) PBL's facilitate students with complex issues that demand analysis, encourage collaborative and stimulating efforts to learn matters of problems to be applicable. According to Macmath, et al (2009) PBL has the key characteristics of (1) using collaborative working groups, (2) using student centered approach, (3) teachers as facilitators and (4) using real-world problems. This statement provides information that in applying the PBL in learning need to pay attention to the problems presented to students and the need for interaction among students in realizing the effort of cooperation among students.

Vygotsky (1978) states that higher mental functions (individuals are unique) contain social (cultural-influenced) and false-social elements are natural. Higher mental functions can be achieved through social interactions involving facts and symbols. Facts and symbols of the cultural environment affect the development of individual understanding. Based on this explanation, it is found that incorporating aspects of culture in the learning of physics can make the mental function of students more increased, so that PBL which is a constructivist based learning model can be done with a cultural approach derived from environmental facts. The concept of physics learning can be found through problem solving that comes from cultural facts around the students. Based on this, it is important for teachers to understand the socio-culture of children, how children interact, utilize facts and cultural environment experienced by students and bring the social situation into learning (Sinaga, 2007).

Efforts to support learning that is integrated with the local culture, it is necessary to develop learning devices that can foster the students' appreciation of the culture. The preparation of integrated learning devices on culture is designed based on local cultural facts. Physical learning can also be integrated with local culture. Especially for in North Sumatra, one of the cultures that can be integrated into physics learning is Malay culture.

Based on observation and preliminary study at SMA N 1 Tanjung Pura, it is found that most of the students are people with Malay tribe. Environment around the school and student residence there are facts of Malay culture in the form of traditional house and Malay cultural tradition. Later, most teachers and students use Malay language and dialect. It can be concluded that students and teachers are very close to Malay culture both in terms of cultural facts contained in the environment and patterns of social interaction in everyday life.

The condition of students and teachers close to Malay culture should be reflected in attitudes and behavior, but there are still issues related to culture. Based on preliminary observations conducted at SMA Negeri 1 Tanjung Pura, it is found that the tradition of deliberation or cooperation in the class between students and teachers and students and students is still very low, whereas Malay culture teaches to solve all problems done by collaborating and working together. In addition, the lack of manners between students and teachers and students and students is still a problem. Another problem related to culture is, where in giving an example of an event or object in learning, the teacher is more likely to stick to the examples contained in the book. Teachers seldom use examples that are lifted from the facts of Malay culture. Based on this explanation, if this problem continues to be feared students can forget and far from the value of Malay cultural teachings and facts.

Malay culture is famous for its polite speech and language, upholding customs with cultural values. These values will be lighter spirits and encourage students to have the appropriate attitude well. For example, the value of Malay teachings contained in the following adage "*ke bukit sama mendaki, ke lembah sama menurun, hidup jelang-menjelang, sakit jenguk-menjenguk, lapang sama bergelar, sempit sama berhimpit*". This proverb is expected to invite students to do a good cooperation, mutual help and mutual opinion. In addition, Malay culture also has a pattern of interaction in solving the problem, this interaction pattern is integrated into the pattern of student interaction in learning. Students have an important role each in solving the problem in accordance with

the pattern of intercultural of Malay culture. It is expected that students are able to interact well with other students as well as with teachers. So the students realize that Indonesia has certain patterns in solving the problems that have been used by old parents from time to time.

In addition to the values of teaching and interaction patterns, there are facts of Malay culture that can be integrated into learning. For example, in the traditional tradition of “*menurunkan bayi*”. This tradition uses a rope or spring to swing the baby. Certainly in this case the concept of physics about elasticity is needed in terms of designing and selecting the type of rope or spring that will be used for the event this traditional tradition can work well. Integrating this cultural fact into learning is expected to make it easier for students to understand the problem because the problem is close and related to the students.

## 2. Literature

### 2.1. Problem Solving Skill

Jonassen (2004) defines the problem as the difference between the results to be achieved with the existing reality. Robertson (2001) describes the problem is if we want to go to B from A but the path is closed. In more detail, a problem is defined as a situation where one solves a problem that has not been worked out yet and does not understand how to solve it (Jonassen, 2004). This explains that the problem is something new to him even if the process or knowledge he has had can be used as an experience to solve it. In general, a problem occurs when a person realizes there is a gap between hope and reality and there is a desire to resolve but not knowing what action to take.

Some understanding of problem-solving skills such as Polya (1973: 23) defines problem solving as an attempt to find a way out of a difficulty in order to achieve a goal that is not so soon achieved. Sumarmo (1994: 4) interpreting problem solving skills as an activity to solve story problems, solve problems that are not routine, apply in everyday life. While indicator of solving skills used are the troubleshooting steps proposed by Nezu, et al (2007) namely, (1) Problem solving attitude; (2) Describe the problem; (3) Generating alternative solutions; (4) Develop alternative solutions and (5) Evaluate.

### 2.2. Self-Regulated Learning

Zimmerman (1990) argues that the theory of student self-reliance is a special academic achievement of learning that gives pressure to become a guide to learning how students choose, classify and create advantages in learning for themselves and control the learning objectives. Further improvement of student learning independence is measured based on indicators proposed by Zimmerman (2000) namely, (1) Preliminary thinking; (2) Performance and (3) Self-reflection.

### 2.3. Problem Based Learning Model Based on Malay Culture

According to Eaude (2008) explains the concept of culture in learning that all children bring many experiences and expectations accumulated from their cultural heritage and from birth, this is called cultural capital. Then Sinaga (2007) argues that student activity during the learning process is based on the principle that one is that: human is the information processing that is active and born in a social matrix, where the way of thinking, perceiving, and acting is influenced by culture, environment and Others around him. Based on the above opinion it can be concluded that the application of culture-based learning can be applied in learning.

The PBL model based on Malay culture is a learning process that applies PBL model steps by incorporating facts of Malay cultural environment in problems solved in learning and incorporating patterns of Malay social and cultural interaction in the learning process.

## 3. Research Methodology

The research method used is Research and Development (R & D) research with 4-D model developed by Thiagarajan which consists of four stages: define, design, develop and disseminate.

### 3.1 Subject and Object

Subjects in this study were students of class X SMA Negeri 1 Tanjung Pura academic year 2016/2017, where as the object of this research is learning devices using problem based learning model based on Malay culture on the material elasticity, problem solving skills and self-regulated learning.

### 3.2. Instrument

The instruments of data collection in the research are validation sheet, observation sheet, and questionnaire. The validation sheet is used to collect the review result data from the validator. Observation sheets are used to determine the implementation of learning, assessing the competence of attitudes, skills, and activities. Filling the questionnaire to obtain data needs analysis and performance analysis. The improvement of problem solving skills and self-regulated learning using the N-Gain by Hake (1999).

#### 4. Results

The result of the research is the product in the form of learning device using the problem based learning model based on Malay culture on elasticity material. The results of research and discussion as follows:

The define stage is performed to define and define requirements in the learning process. This stage consists of the beginning-end analysis, student analysis, concept analysis, task analysis, and objectives specifications of learning. The results of the final analysis concluded that the required learning device that refers to the problem based learning model based on Malay culture in the development of learning devices. The result of student's analysis is obtained that the student's academic skill is still low, the student's learning style which is active in the group as well as the background of the dominant tribe of Malay students makes the learning device using the problem based learning model based on Malay culture can be applied. Concept analysis is an analysis of the main concepts of the material to be taught. The result of task analysis obtained refers to the concept analysis and learning objectives based on Core Competence (KI) and Basic Competence (KD) which have been established in accordance with the 2013 curriculum.

Design stage is done through preparation of test and nontest, format selection, media selection and initial design of learning device. The results of the tests compiled in this study is a test of physics and non-test problem solving problems that compiled is a questionnaire that shows students' learning independence in learning. The results of the format selection in this study are adjusted to the curriculum of 2013, namely Permendikbud. 103 year 2014. Furthermore, the format of Student Book refers to the rules of BSNP (National Education Standards Board) and the format of LKS is adapted to the stages of problem based learning model based on Malay culture. The result of media selection or teaching aids is used visual media in the form of picture of physical culture of Malay culture, in the form of Malay custom house picture, spring used in event of lowering baby, stative, ruler and some elastic objects. The results of initial design in the form of RPP, teacher book, student book and LKS for 3 times meetings as well as instruments of problem solving skills test and questionnaire student self-regulated.

Stage Develop aims to modify and develop learning devices that have been made in the previous stage of define and design. After the device is designed in the form of draft I, then at this stage tested the validity by expert validator and field trials. The test of learning device validation through problem based learning model based on Malay culture in the form of RPP, LKS, teacher book and student book is done by expert of validator consisting of lecturer and teacher.

Table 1. Validation Result by Expert of Validator

Learning Devices	Avarage of Value	Category
RPP	4,49	Good
LKS	4,54	Good
Students' Book	4,54	Good
Teacher' Book	4,57	Good

Table 1 gives the conclusion that the learning devices in draft I with various revisions have been used for trial. In addition, the problem solving skills test and questionnaire self-regulated learning test has been validated by an expert and declared valid with various revisions. The design of learning devices in the revised draft I is called draft II. This learning device is ready to be tested in the field. Field trials were conducted twice, namely trial I and trial II. These trials are conducted to determine the practicality and effectiveness of the learning devices developed. Learning devices are said to be practical if there is an expert statement that the device is worthy of use and the value of the implementation of learning using the device is good or very good (Nieveen, 2007; Akker, 2009; Herman 2012). While the effectiveness of learning devices seen from the students' learning completeness in the classical, student activities and responses given to the learning device students (Nieveen, 2007; Akker, 2009; Herman 2012; Suyitno, et al., 2013; Slavin, 2006, Reiguluth, 2000).

Trial I of learning device using model based learning based on Malay culture was conducted on 5 students of class XI MIA I SMAN 1 Tanjung Pura. This experiment was conducted by the researcher as a teacher and two observers to observe the implementation of learning and student activities. The researcher has obtained the appropriate approval from the expert to use the learning device in the second draft, then the learning implementation in the first test obtained an average of 2.82 and it is still in enough category ( $2 < P \leq 3$ ).

Students' learning completeness is classical in the first test that is equal to 40%, where the limit of effective criterion fulfillment is 75% of students complete (Herman, 2012). Student activity increases at each meeting.

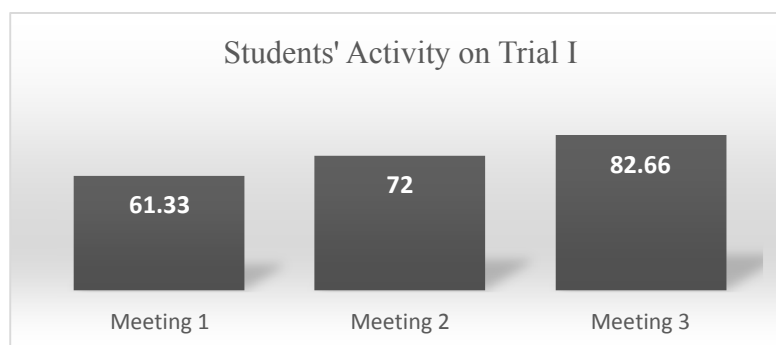


Figure 1. Students' Activity on Trial I

Figure 1 gives the conclusion that on average the overall activity of the student is still in enough category. Positive student response to learning device in this test is 83,88% where the effectiveness limit of 80% of students give positive response.

Based on the above description it can be concluded that the device in draft II is not yet practical and has not been effective so it needs a revision based on analysis from trial I. The revised learning device is called draft III. Draft III is the final draft that will be in trial II.

Trial II was conducted in class X MIA III SMAN 1 Tanjung Pura with the number of 32 students. Trial II was conducted to measure draft III as a learning device using problem based learning model based on Malay culture model that fulfilled all the established and practical criteria. Result of trial II that have been done can be concluded that learning device using problem based learning model based on Malay culture developed has fulfilled all the criteria of practical and effective set. The practicality of instructional devices as measured by the validity and implementation of learning devices has been better than trial I.

Table 2. Score of Implementation of Learning Devices Trial I

Avarage Every Meet			Total Avarage	Category
1	2	3		
4,12	4,33	4,40	4,28	Very High

The overall learning device implementation in trial II is 4.26, which, if referenced to the predefined instruction learning device criteria, then the average value of 4.28 is in very high category ( $4 < P \leq 5$ ).

The effectiveness of learning devices using problem based learning model based Malay culture has fulfilled all the criteria set and can be said to be effective.

Table 3. Level of Students' Complete Learning by Classical Trial II

Category	Problem Solving Skill	
	The Number of Student	Percentage
Complete	28	87,5%
Not Complete	4	12,5%
Amount	32	100%

If it is referenced in classical student completeness criterion, that is at least 80%, it can be concluded that the result of postes of problem solving skill in trial II has fulfilled the effective criteria that is 87,5% of student have been completed in pursuit of completeness in classical. Furthermore, the student activity during the learning process using problem based learning model based on Malay culture is done by observation.

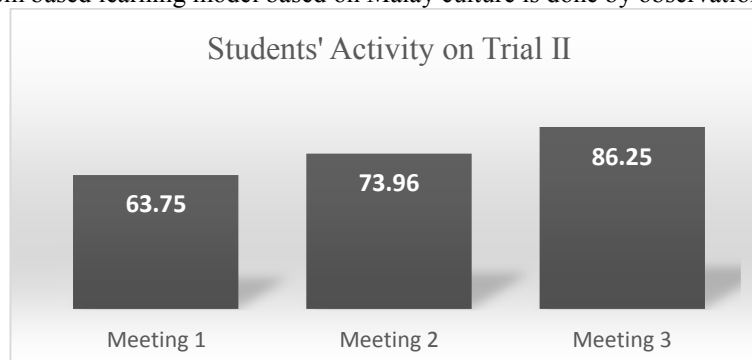


Figure 2. Students' Activity on Trial II

Overall the average student activity has increased. Thus it can be concluded learning device using problem based learning model based on Malay culture developed effectively in terms of student activity that has achieved improvement.

The student's response gave the average total positive response in the second try of 96.06%. If the results of



this analysis are referenced to the criteria set forth in chapter III, it can be concluded that the students' responses to the components and learning activities are positive. Based on the analysis of trial II data, it is known that the learning devices using problem based learning model based on Malay culture has fulfilled all valid, practical and effective criteria. So there is no revision of draft III on instructional device that developed using problem based learning model based on Malay culture on elasticity after trial II.

The disseminate stage is the final stage in the 4-D development model. At this stage, learning devices that have been piloted in the research class will be re-tested by comparing the developed learning device (experimental class) with the device used by physics subject teachers in SMA Negeri 1 Tanjung Pura (control class). However, this stage is not carried out by researchers, due to time, cost and energy constraints so that this stage is not discussed in depth.

Data obtained from posttest result of problem solving skill of student on trial II was analyzed to know improvement of problem solving skill of student by comparing mean score of student obtained from posttest result of problem solving skill of student each meeting on trial II.

Table 4. N-Gain of Problem Solving Skill

Meet	N-gain	Category
I	0,29	Low
II	0,35	Medium
III	0,50	Medium

Based on Table 4, the problem solving skills of students at each meeting has increased so that it can be concluded that the application of learning devices using problem based learning model based on Malay culture can improve students' physics problem solving skills.

Student self-regulated data was obtained based on the increase of students' learning independence value in posstest and pretest which was assessed based on indicators of learning independence.

Table 5. Improvement Self-regulated Learning

Pretest' Avarage	Postest' Avarage	N-Gain	Category
72,63	59,19	0,33	Medium

Table 6. Improvement Self-regulated Learning Every Indicators

No	Indicators	Postest	Pretest
1	Preliminary Thinking: Setting learning goals and self-confidence skills	3,67	2,93
2	Self Performance: self-control skills in learning	3,57	2,94
3	Self-Reflection: Self-evaluation skills after learning	3,65	3,06

Based on Table 5 and Table 6 above, it can be concluded that the average of questionnaire results of student cooperation increased from pretest to posttest result in trial II. Increasing students' independence in every aspect of indicators after the treatment of learning devices using a model based problem based on Malay culture.

## 5. Conclusion

Based on the result of analysis and discussion in this research, it can be concluded that: 1) Validity of learning device using problem based learning model based on Malay culture has valid for use with average total validity RPP = 4,49, Student Book = 4,54, Teacher's Books = 4.54, LKS = 4.57, as well as test-solving skills and cooperation questionnaire devices have also been valid based on the assessment by expert validators; 2) The practicality of learning devices through problem based learning model based on Malay culture has been easy to use in learning. This is based on the assessment of experts and observation of the implementation of learning with good category; 3) The effectiveness of learning devices using problem based learning model based on Malay culture has been said to be effective for use in learning. This is based on the completeness of learning has classically exceeded the minimum limit of 87.5% and student response has also been positive with a percentage of 96.06%. 4) There is improvement of students' physics problem solving skills and self-regulated learning after applying learning device using Malay culture based model of learning based on elasticity material of phsysics lesson.

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